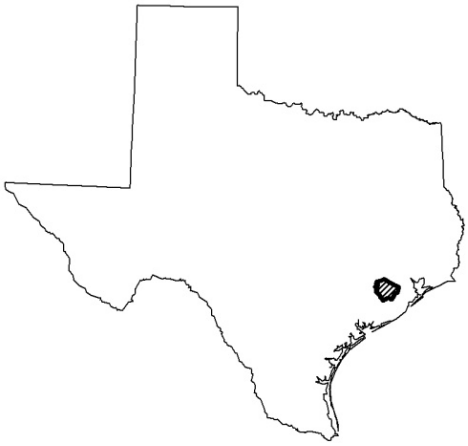
Notice

This preliminary FIS report includes only revised Flood Profiles and Floodway Data tables for Sims Bayou. See "Notice to Flood Insurance Users" page for additional details.

FLOOD INSURANCE STUDY

FORT BEND COUNTY, TEXAS AND INCORPORATED AREAS

Community Name	Community Number
ARCOLA, CITY OF	481619
FAIRCHILDS, VILLAGE OF	481675
FIRST COLONY L.I.D.	481583
FORT BEND COUNTY L.I.D. NO. 2	481485
FORT BEND COUNTY L.I.D. NO. 7	481594
FORT BEND COUNTY M.U.D. NO. 2	481272
FORT BEND COUNTY M.U.D. NO. 23	481590
FORT BEND COUNTY M.U.D. NO. 25	481570
FORT BEND COUNTY M.U.D. NO. 34	481520
FORT BEND COUNTY M.U.D. NO. 35	481519
FORT BEND COUNTY M.U.D. NO. 41	481591
FORT BEND COUNTY M.U.D. NO. 42	481605
FORT BEND COUNTY UNINCORPORATED AREAS	480228
FULSHEAR, CITY OF	481488
HOUSTON, CITY OF	480296
KATY, CITY OF	480301
KENDLETON, CITY OF	481551
KINGSBRIDGE M.U.D.	481567
MISSOURI CITY, CITY OF	480304
NEEDVILLE, CITY OF	480820
PEARLAND, CITY OF	480077
PECAN GROVE M.U.D.	481486
PLEAK, VILLAGE OF	481615
RICHMOND, CITY OF	480231
ROSENBERG, CITY OF	480232
SIMONTON, CITY OF	481564
STAFFORD, CITY OF	480233
SUGAR LAND, CITY OF	480234
THOMPSONS, TOWN OF	481642
WESTON LAKES, CITY OF	481197
WEST KEEGANS BAYOU I.D.	481602
WILLOW FORK DRAINAGE DISTRICT	481603



NON FLOOD PRONE COMMUNITIES

Community Name	Community Number
BEASLEY, CITY OF	481654
BIG OAKS M.U.D.	481596
CHELFORD CITY M.U.D.	481568
FORT BEND COUNTY M.U.D. NO. 30	481601
MEADOWS PLACE, CITY OF	481563
MISSION BEND M.U.D. NO. 1	481578
ORCHARD, CITY OF	481655

PRELIMINARY

January 30, 2017

Revised: _____, 2018

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

48157CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide Flood Insurance Study Date Effective Date: September 30, 1992

First Revised Countywide Flood Insurance Study Date: January 3, 1997

Second Revised Countywide Flood Insurance Study Date: April 20, 2000

Third Revised Countywide Flood Insurance Study Date: November 7, 2001

Fourth Revised Countywide Flood Insurance Study Date: April 2, 2014

Fifth Revised Countywide Flood Insurance Study Date:_____, 2018 – to update corporate limits, to change Base Flood Elevations, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, to incorporate previously issues Letters of Map Revision, and the reflect updated topographic information.

This preliminary revised Flood Insurance Study contains only Floodway Data tables or Flood Profiles added or revised as part of the revision. All other Floodway Data tables and Flood Profiles will appear in the final FIS report.

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FLOOD INSURANCE STUDY
FORT BEND COUNTY AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Fort Bend County, including the First Colony Levee Improvement District (L.I.D.); Fort Bend County L.I.D. Nos. 2 and 7; Fort Bend County Municipal Utility District (M.U.D) Nos. 2, 25, 34, 35, 41, and 42; Kingsbridge M.U.D.; Pecan Grove M.U.D.; West Keegans Bayou Improvement District (I.D.); Willow Fork Drainage District; Cities of Arcola, Beasley, Fulshear, Houston (within Fort Bend County), Katy (within Fort Bend County), Kendleton, Meadows Place, Missouri City (within Fort Bend County), Needville, Orchard, Pearland (within Fort Bend County), Richmond, Rosenberg, Simonton, Stafford, Sugar Land, Weston Lakes; the Town of Thompsons; the Villages of Fairchilds and Pleak; and the unincorporated areas of Fort Bend County (referred to collectively herein as Fort Bend County). The following jurisdictions are considered non-flood prone for their areas within Fort Bend County: the Big Oaks M.U.D.; Chelford City M.U.D.; Fort Bend County M.U.D. No. 30; Mission Bend M.U.D. No.1; and Cities of Beasley, Meadows Place, and Orchard. The Cities of Houston, Katy, Missouri City, and Pearland are located in two or more counties. Also, Fort Bend County M.U.D. No. 81 has been annexed by the City of Weston Lakes and no longer exists.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgements

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This revision of the FIS was prepared by the Comprehensive Flood Risk Resources & Response Joint Venture (hereinafter referred to as CF3R) for FEMA under contract No. EMT-2002-CO-0049. This effort was part of the Digital FIRM (DFIRM) Update for Fort Bend County which was a joint effort by the Department of Homeland Security's Federal Emergency Management Agency (FEMA) and its Cooperating Technical Partners (CTP), Fort Bend County and the City of Sugar Land.
Information concerning the authority and acknowledgements for each jurisdiction shown on this countywide FIS, compiled from the 2001 FIS report, is detailed below.

Fort Bend County and Certain Political Districts
The hydrologic and hydraulic analyses in the original study were prepared by Espey, Huston & Associates, Inc., now Atkins for the Department of Home Land Security's FEMA, under Contract No. H-4569. The work for that study was completed in April 1980. Also included are the hydrologic and hydraulic analyses for the Brazos River, which were prepared by Atkins. This work was completed in May 1985. In the June 3, 1988 revision, updated hydrologic and hydraulic analyses for portions of Dry Creek were prepared by LJA Engineering & Surveying, Inc. The work for that revision was completed in April 1987. In the May 3, 1990 revision, updated hydrologic and hydraulic analyses for Clodine Ditch were prepared by Vansickle, Mickelson & Klein, Inc. The work for that revision was completed in October 1988. In the June 18, 1990 revision, updated hydrologic and hydraulic analyses for Red Gully were prepared by LJA Engineering & Surveying, Inc. The work for that revision was completed in May 1989.

First Colony L.I.D., and the City of Fulshear
The hydrologic and hydraulic analyses for these studies were prepared by Atkins, during the preparation of the FIS for Fort Bend County. That study was prepared for FEMA, under Contract No. H-4569. The work for that study was completed in May 1985.

Fort Bend County L.I.D. No.2, Fort Bend County M.U.D. No.2, and Kingsbridge M.U.D.
The hydrologic and hydraulic analyses for these studies were prepared by Atkins.

Fort Bend County M.U.D. No. 25
The hydrologic and hydraulic analyses for this study were prepared by Atkins. Updated hydraulic analyses for Red Gully were prepared by Dewberry & Davis in July 1985.

Pecan Grove M.U.D.
The hydrologic and hydraulic analyses for this study were prepared by Atkins in November 1985.

City of Missouri City
The hydrologic and hydraulic analyses for the original study were prepared by Atkins, for FEMA, under Contract No. H-4569. That work was completed in April 1980. Updated hydrologic and hydraulic analyses for the Brazos River were prepared by Atkins. This work was completed in May 1985.

City of Richmond
The hydrologic and hydraulic analyses for the original study were prepared by Atkins for FEMA, under Contract No. H-4569. That work was completed in April 1980. Updated hydrologic and hydraulic analyses for the Brazos River were prepared by Atkins. That work was completed in May 1985. A revision was also prepared by Dewberry & Davis to reflect updated corporate limits for the city. That work was completed in August 1986.

City of Rosenberg
The hydrologic and hydraulic analyses in the original study were prepared by Atkins for FEMA, under Contract No. H-4569. That work was completed in April 1980. Updated hydrologic and hydraulic analyses for Dry Creek and North Branch Dry Creek were prepared by Vansickle, Mickelson & Klein, Inc., under agreement with FEMA. That work was completed in October 1988. Updated hydrologic and hydraulic analyses for portions

of Seabourne Creek were prepared by LJA Engineering & Surveying, Inc, for FEMA. That work was completed in December 1988. Updated hydrologic and hydraulic analyses for the Brazos River were prepared by Atkins for FEMA, during the preparation of the FIS for Fort Bend County. That work was completed in December 1988.

City of Simonton
The hydrologic and hydraulic analyses for this study were prepared by Atkins for FEMA, during the preparation of the Flood Insurance Study for Fort Bend County. That work was completed in May 1985.

City of Stafford
The hydrologic and hydraulic analyses for this study were performed by Atkins for FEMA, under Contract No. H-4569. That work was completed in April 1980.

City of Sugar Land
The hydrologic and hydraulic analyses for the original study were prepared by Atkins for FEMA, under Contract No. H-4569. The work for that study was completed in April 1980. Updated hydrologic and hydraulic analyses were prepared by Atkins. That work was completed in May 1985. A revision was also prepared by Dewberry & Davis to reflect updated corporate limits for the city. That work was completed in June 1986.

Village of Pleak
The hydrologic and hydraulic analyses for this study were prepared by Atkins during the preparation of the FIS for Fort Bend County. The work for that study was completed in April 1980.

The effects of updated hydrologic and hydraulic analyses for Dry Creek, incorporated in the City of Rosenberg FIS, were prepared by Vansickle, Mickelson, & Klein, Inc. That work was completed in October 1988.

For this revision, the hydrologic and hydraulics analyses for Oyster Creek, Lower Oyster Creek, and Brazos River were prepared by CF3R. The hydrologic and hydraulics analyses for Cane Island, Clear Creek (from the Fort Bend/Harris County line to FM 2234), and Keegans Bayou (from Fort Bend/Harris County line to Belknap Road) were prepared as part of the Harris County and Incorporated Areas Flood Insurance Study, dated June 18, 2007 (Harris County 2007 FIS) (Reference 1). In addition, the flood hazard boundaries for other detailed study streams were redelineated based on the 2001 floodplain data, approved LOMR's, and the LiDAR topographic data collected in 2005. The 2001 flood hazard boundaries for Zone A streams were remapped based on enhanced approximate studies. All the work was completed in September 2009.

1.3 Coordination

The dates of the initial and final Consultation and Coordination Officer's (CCO) meetings held for Fort Bend County and the incorporated communities within its boundaries are shown in the following tabulation:

Community Name	Initial CCO Date	Final CCO Date
Fort Bend County and Certain Political Districts	May 12, 1978	June 11, 1984
First Colony L.I.D.	*	September 26, 1986
Fort Bend County L.I.D. No. 2	*	November 17, 1983
Fort Bend County M.U.D. No. 2	*	November 17, 1983
Fort Bend County M.U.D. No. 25	*	November 21, 1985
Fort Bend County M.U.D. No. 81		
Kingsbridge M.U.D.	*	November 17, 1983
Mission Bend M.U.D. No. 1	*	*
Pecan Grove M.U.D.	*	September 26, 1986
City of Fulshear	*	September 26, 1986
City of Houston	*	*
City of Missouri City	May 12, 1978	April 4, 1981
City of Needville	*	*
City of Richmond	May 12, 1978	April 10, 1981
City of Rosenberg	May 12, 1978	April 10, 1981
City of Simonton	*	September 25, 1986
City of Stafford	May 12, 1978	April 9, 1981
City of Sugar Land	May 12, 1978	April 9, 1981
Village of Pleak	*	*

* Unavailable

For this revision, the initial CCO meeting was held on May 10, 2004 and attended by representatives of FEMA, CF3R, community and county officials, other interested agencies and citizens.

The results of the study were reviewed at the final CCO meeting held on January 26, 2010, and attended by representatives of FEMA, the State of Texas, the communities, and the study contractor. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Fort Bend County, Texas, including the incorporated communities listed in Section 1.1. Table 1, "Scope of Study", lists the limits of detailed study for flooding sources studied by the detailed and redelineation methods in this revision.

TABLE 1 – SCOPE OF STUDY

Detailed Study Streams	Limits of Detailed Study
Brazos River	For its entire length within the county
Cane Island Branch	From the confluence with Willow Fork Buffalo Bayou to the County Boundary.

TABLE 1 – SCOPE OF STUDY (Continued)

Redelineated Detailed Study Streams	Limits of Detailed Study
Clear Creek	From the upstream of the Farm Road 34 to the downstream side of the upper FM 2234 crossing
Keegans Bayou	From the County Boundary to the downstream of Belknap Road
Oyster Creek	From Jones Creek to Flat Bank diversion channel in Missouri City
Lower Oyster Creek	From Flat Bank diversion channel to the Sienna Plantation Levee diversion channel
Clear Creek	From the upstream side of the upper FM 2234 crossing to upstream of the Roven Road
Clodine Ditch/Long Point Slough	From the downstream county boundary to a point approximately 3.15 miles upstream of Harlem Road
Coon Creek	From a point approximately 130 feet downstream of Band Road to Randon Road
Cow Creek	From its confluence with the Brazos River to a point approximately 8.14 miles upstream
Dry Creek	From the downstream face of Berdett Road to a point approximately 1,100 feet upstream of State Route 36
Keegans Bayou	From the upstream of Belknap Road to a point approximately 0.9 mile upstream of Gaines Road
Little Prong Buffalo Bayou	From its confluence with Willow Fork Buffalo Bayou to a point approximately 2.5 miles upstream
Little Prong Buffalo Bayou Side Channel	From its confluence with Willow Fork Buffalo Bayou to a point approximately 1.3 miles upstream
Long Point Creek	From Briscoe Canal to a point approximately 0.5 mile upstream of Trammel-Fresno Road

TABLE 1 – SCOPE OF STUDY (Continued)

Redelineated Detailed Study Streams	Limits of Detailed Study
Long Point Creek East Fork	From its confluence with Long Point Creek to a point approximately 0.7 mile upstream of Trammel-Fresno Road
Mustang Bayou	From the downstream county boundary to a point approximately 1,600 feet upstream of Turtle Creek Drive
North Branch Dry Creek	From its confluence with Dry Creek to a point approximately 470 feet upstream of Leonard Street
Red Gully	From its confluence with Oyster Creek to FM 1464
Seabourne Creek	From a point approximately 0.4 mile downstream of State Route 36 to the upstream side of Scott Road
Stafford Run	From a point approximately 1,030 feet upstream of its confluence with Oyster Creek to a point approximately 0.3 mile upstream of Brand Road
Willow Fork Buffalo Bayou	For its entire length within Fort Bend County
Willow Fork Diversion Channel	From the City of Houston corporate limits to its divergence from Willow Fork Buffalo Bayou

Base flood elevations, 1% and 0.2% annual chance floodplain boundaries, and floodway delineations for Dry Creek were revised from a point approximately 4,000 feet downstream of Bryan Road to Bryan Road. These changes resulted from the effects of updated hydrologic and hydraulic analyses, performed by Vansickle, Mickelson, & Klein, Inc., for Dry Creek in the FIS for the City of Rosenberg (Reference 2) .

The fourth revision incorporates the effects of annexations or deannexations of most communities in Fort Bend County. In addition, the corporate limits for the City of Weston Lakes and the City of Pearland have been added to the FIRM for this revision.

This revision also incorporates Letters of Map Revision that were issued by FEMA after the latest date, June 27, 1996, shown on Table 1 of the 2001 FIS report. Note that some were only partially incorporated as portions were subsequently revised by a later LOMR. They are listed in Table 2, "Letters of Map Revision."

TABLE 2: LETTERS OF MAP REVISION

Project	Stream	Date
Fort Bend County L.I.D. No. 2	Ditch A, Ditch C, Ditch E, Lakes of Edgewater, Grants Lake	October 16, 1997
Bulkhead Lake	Oyster Creek	January 7, 1998
Fort Bend County L.I.D. No. 10	Brazos River	April 22, 1998
Fort Bend County L.I.D. No. 14	Brazos River	May 8, 1998
Fort Bend County L.I.D. No. 2	Ditch A	October 19, 1998
First Colony L.I.D.	Oyster Creek, Unnamed Tributary to Oyster Creek, Two Unnamed Ponds	December 29, 1998
First Colony L.I.D.	Oyster Creek	September 30,1999
Fort Bend County L.I.D. No. 11	Brazos River	November 5, 1999
Willow Fork Buffalo Bayou, Katy-Flewellen Road to Downstream of FM 1463	Willow Fork Buffalo Bayou	January 31, 2000
West Keegans Bayou Improvement District	Keegans Bayou	February 10, 2000
Fort Bend County M.U.D. Nos. 34 and 35	Little Prong Buffalo Bayou, Little Prong Buffalo Bayou Side Channel	March 31, 2000
Stafford Run Improvement	Stafford Run	March 23, 2001
First Colony L.I.D., Colony Bay L.I.D., Riverstone Development	Interior Levee Drainage	June 12, 2002
FM 1463 Katy Tract	Willow Fork Buffalo Bayou	August 20, 2002
Sienna Plantation L.I.D.	Brazos River	August 22, 2002
Sprint Landfill	Red Gully	December 31, 2002
Seabourne Creek Improvement	Seabourne Creek	October 29, 2003
First Colony L.I.D., Colony Bay L.I.D., Riverstone Development	Interior Levee Drainage	November 12, 2003
Firethorne Property	Willow Fork Buffalo Bayou	January 14, 2004
Fort Bend L.I.D No. 14	Brazos River	February 10, 2004
Fort Bend County M.U.D. No.121	Brazos River	March 15, 2004
Fort Bend County MUD 23	Long Point Creek	April 30, 2004
The Crossings at Riverstone Phase 3	Unnamed Zone A Ponding Area	August 17, 2004
The Crossings at Riverstone Phase 3	Unnamed Zone A Ponding Area	September 27, 2004
Olympia Estates	Mustang Bayou	December 9, 2004
Firethorne Property	Willow Fork Buffalo Bayou	January 14, 2005

TABLE 2: LETTERS OF MAP REVISION

Project	Stream	Date
Olympia Estates (map correction)	Mustang Bayou	January 27, 2005
Katy Creek Ranch Development	Willow Fork Buffalo Bayou	August 10, 2005
Sienna North Levee	Brazos River	May 26, 2006
Fort Bend L.I.D. No 17	Brazos River	January 25, 2007
Woodcreek Reserve	Willow Fork Buffalo Bayou	February 26, 2007
Seabourne Trace	Seabourne Creek	May 31, 2007
Winfield Lakes	Long Point Creek	September 27, 2007
Woodcreek Commercial Reserve	Willow Fork Buffalo Bayou	December 14, 2007
Fort Bend County MUD 23	Long Point Creek East Fork	December 31, 2008
Fort Bend L.I.D. No.10	Brazos River	May 13, 2009
Woodcreek Reserve	Willow Fork Buffalo Bayou	August 17, 2009
Fort Bend L.I.D. No 17	Brazos River	August 21, 2009
Fort Bend L.I.D. No.6	Brazos River	January 5, 2010
West WWTP	Brazos River	March 19, 2010
Fort Bend L.I.D. No 15	Brazos River; Alcorn Bayou; Snake Slough; Steep Bank Creek	April 2, 2010
Fort Bend L.I.D. No 19	Brazos River; Steep Bank Creek; Lake 83	April 9, 2010
Fort Bend L.I.D. No.20	Brazos River; Lake 1	March 30, 2011
Lower Snake Creek	Snake Creek	July 8, 2011
Fort Bend LIDs No. 15 and 19	Alcorn Bayou, Snake Slough, SB Lakes 81 & 82, Diversion	July 5, 2012
Fort Bend LID 15 Internal System	Alcorn Bayou, Snake Slough, AB Lakes A1 & A2, SS Lake 1	June 6, 2013
Katy Main Street	Willow Fork Buffalo Bayou & Cane Island Branch	August 2, 2013

The San Bernard River, Turkey Creek, Snake Creek, Cottonwood Creek, Buffalo Creek, Fairchilds Creek, Big Creek, Deer Creek, Cedar Creek, Bessies Creek, Brookshire Creek, Bullhead Bayou, Jones Creek, Rabbs Bayou, and the remaining portions of Coon Creek, Seabourne Creek, Clear Creek, Dry Creek, Long Point Creek, Oyster Creek, Red Gully, Cow Bayou, Flat Bank Bayou, Albine Lake, Brooks Lake, Clear Lake, Eldridge Lake,

Horseshoe Lake, North Lake Sugar Creek, South Lake Sugar Creek, North Pecan Lake, Lake Jane Long, Cleveland Lake, Brooks Lake Diversion Channel, Ditch H, Venetian Lake, Ditch A, Ditch B, Ditch B-1, Ditch C, Ditch C-l, Ditch E, Ditch F, Brooks Lake, Omar Lake Diversion, Flewellan Creek, Mound Creek, Cedar Creek, San Bernard River, Sugar House Lake, Lawson Lake, Brushy Lake, Foss Creek, Smithers Lake, an unnamed tributary to Oyster Creek, and an unnamed lake were studied by approximate methods. Portions of Stafford Run were also studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by FEMA and communities in Fort Bend County.

2.2 Community Description

Fort Bend County is located along the Gulf Coast region in the US state of Texas within the Houston-Sugar Land-Baytown metropolitan area. It is bordered by Waller County to the north, Wharton County to the southwest, Harris County to the east, Brazoria County to the southeast, and Austin County to the northwest. In 2000 the Fort Bend County's population was 354,452; in 2008, the US Census Bureau estimated its population to have reached 532,141, a 50% growth rate in eight years from the last US Census. Since the 1970s Fort Bend County has been one of the fastest-growing counties in the United States. Its county seat is Richmond, while its largest city is Sugar Land (Reference 3).

The county comprises 869 square miles of level to slightly rolling terrain with an elevation ranging from eighty to 250 feet above sea level. Temperatures range from an average high of 94° F in July to an average low of 44° F in January; rainfall averages slightly more than forty-five inches a year, and the growing season lasts 296 days. The Brazos River flows diagonally northwest to southeast through the county and drains the broad central valley via numerous creeks and bayous. The San Bernard River, which forms the west boundary, drains the western quarter of the county. Major streams include Big Creek, which flows east into the Brazos River; Oyster Creek, which winds parallel to and east of the Brazos River; and Buffalo Bayou, which rises in the northern tip of the county and flows east into Harris County. Soils vary from rich alluvial in the Brazos valley to sandy loams and clay on the prairies. Native trees include pecan, oak, ash, and cottonwood; there are some timberlands in the north and along streams. Mineral resources include natural gas, oil, and sulfur; sand, clay, and gravel are also produced in commercial quantities (Reference 4).

2.3 Principal Flood Problems

Reports on historic flooding show that major storms or floods in the area occurred in 1899, 1900, 1913, 1915, and 1929. The flood of 1899 and the storm of 1900 caused much damage to Fort Bend County. Crops, stock, and lives were lost during these two events. The City of Richmond suffered some of the greater losses. Four to five feet of water was seen for several days, and in some places for a stretch of land seven miles wide. The floods of 1913 and 1929 left water covering large portions of the Cities of Rosenberg and Richmond. It was reported that during the 1913 flood, the waters of the Brazos, San Bernard, and Colorado Rivers met below Rosenberg.

The 1991 flooding event caused by heavy rains from the Gulf of Mexico storm was one of the largest rainfall totals in Texas recorded history. Downstream, the Brazos River and

Oyster Creek merged as the Brazos River flowed over the left floodplain near Harris Reservoir. Residential flooding was widespread above in Simonton to the Gulf in Fort Bend and Brazoria Counties (Reference 5).

The October 1994 floods were the deadliest Southeast Texas weather event since 1983's Hurricane Alicia. Heavy rains began falling late afternoon on the 16th across Burleson, Brazos, Grimes and Washington counties. On the night of the 17th and on the 18th rains continued to slide further south and began affection people in Jackson, Wharton, Matagorda, Brazoria, and portions of Fort Bend counties. Total rainfall from the entire storm generally ranged from 10 to 20 inches with Liberty recording 30.50 inches during the storm. Over 13,000 people had to be evacuated during the floods and over 22,000 homes received flood damage. Total damage to homes and businesses was approximately $800 million while another $100 million was done to roads and bridges throughout Southeast Texas (Reference 6).

The October 1998 Texas flooding was a flood event that occurred across parts of South Texas and Southeast Texas. The storm that caused it was one of the costliest in the recorded meteorological history of the United States, bringing rainfall of over 20 inches to some parts of Southeast Texas (the Houston-Sugar land-Baytown and Beaumont – Port Arthur metropolitan areas) and causing over $750 million in damages (Reference 7).

2.4 Flood Protection Measures

Diversions from Oyster Creek to the Brazos River by way of the Brooks Lake, which is located near the intersection of U.S. Highway 59 and State Highway 6, and to Jones Creek north of Richmond has reduced flooding along Oyster Creek.

Keegans Bayou was channelized in 1984 by The West Keegans Bayou Improvement District (WKBID) (Reference 8). In 1999, WKBID constructed detention ponds along Keegans Bayou at upstream and downstream of Gaines Road. The channelization and detention ponds provide protection against the 1% annual chance flood from Keegans Bayou in Fort Bend County.

A channelization project has been completed on Red Gully by the U. S. Home Corporation. This project included the channel deepening and widening of Red Gully from the confluence with Oyster Creek to a point approximately 7,500 feet upstream within the corporate limits of Fort Bend County M.U.D. No. 25. The channelization was designed to contain the 1% annual chance flood elevation of Red Gully. A diversion channel has been constructed from the confluence with Mustang Bayou to Hermann Hospital Lake (in Missouri City) in 2004 to reduce the 1% flooding of the Mustang Bayou. A channel improvement along Stafford Run and construction of four in-line detention ponds from Northpark Drive to Brand Road has been completed in 2000. The project has reduced the 1% flood elevations of Stafford Run.

A large percentage of development in Fort Bend County (FBC) has occurred along the Brazos River within the 1% annual chance floodplain. These developments are protected by levees constructed and maintained by several L.I.D.s and M.U.D.s. Due to the revised

base flood elevations of the Brazos River study from this revision and FEMA reemphasis on levee recertification through Procedure Memorandums 32 and 34 (References 9 and 10), FBC has spearheaded a parallel program to raise the levee systems to bring them into compliance with FEMA certification requirements. Several of the levee systems are interconnected, with the outer perimeter levees providing primary protection and the interior levees providing secondary layers of protection.

On the north side of the Brazos River, FBC L.I.D.s 2, 14, 15, 19, First Colony L.I.D. and L.I.D. 2, and FBC M.U.D. 46 cooperated on raising the perimeter system which connects their districts. On the south side of the River, FBC L.I.D.s 10, 11 and M.U.D. 121 along with the newly created FBC L.I.D. 6, cooperated on raising the existing levees and building two new segments of levee to connect these districts with a perimeter system. The remaining districts (FBC L.I.D. 17 and L.I.D. 7) undertook independent projects to raise their respective levees. Except for FBC L.I.D. 7, those projects have been completed and re-certifications have been submitted to FEMA for processing. Improvement to the Pecan Grove Levee is under design at the completion of this revision. All constructed levees along the Brazos River from U.S. 90A to the South Texas Water Company Canal are listed in Table 3.

TABLE 3: LEVEES IN THE BRAZOS RIVER

Levees	Note
Pecan Grove M.U.D.	Included in the 2001 FIS report
Fort Bend County L.I.D. 7	Included in the 2001 FIS report
Fort Bend County L.I.D. 10	Included in the 2001 FIS report
Fort Bend County L.I.D. 2	Included in the 2001 FIS report
First Colony L.I.D.	Included in the 2001 FIS report
First Colony L.I.D. 2	Included in the 2001 FIS report
Fort Bend County M.U.D. 46	Included in the 2001 FIS report
Fort Bend County M.U.D. 49	Included in the 2001 FIS report
Sienna Plantation L.I.D.	Included in the 2001 FIS report
Fort Bend County L.I.D. 14	LOMR Case #98-06-784P
Fort Bend County L.I.D. 11	LOMR Case #99-06-1722P
North Sienna Plantation L.I.D.	LOMR Case #02-06-266P
Fort Bend County M.U.D. 121	LOMR Case #03-06-449P
Fort Bend County L.I.D. 17	LOMR Case #06-06-BD92P
Fort Bend County L.I.D. 15	LOMR Case #07-06-2682P
Fort Bend County L.I.D. 6	LOMR Case #09-06-2928P
Fort Bend County L.I.D. 19	LOMR Case #09-06-0987P
Fort Bend County L.I.D. 20	LOMR Case #11-06-1803P

There are also levees to protect the flooding from Oyster Creek in Fort Bend L.I.D. No.2, First Colony L.I.D., M.U.D. 46, and M.U.D. 49. The levees in Fort Bend County that meet the Code of Federal Regulations at 44 CFR, 65.10 are shown on the DFIRMs with the appropriate notes.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent annual chance, respectively; of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood, which equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of

completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were performed to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

3.1.1 New Detailed Study Streams

Six new detailed studies of Cane Island, Clear Creek, Keegans Bayou, Oyster Creek, Lower Oyster Creek, and Brazos River were completed in this revision.

For Cane Island Branch, hydrology analysis was developed as part of the Harris County 2007 FIS, using the US Army Corps of Engineers' (USACE) HEC-HMS computer program (Reference 11).

For Clear Creek, from FM 2234 to the Harris and Fort Bend County line, hydrology analysis was developed as part of the Harris County 2007 FIS, using the USACE HEC-HMS computer program.

For Keegan Bayou, from Belknap Road to the Harris and Fort Bend County line, hydrology analysis was developed as part of the Harris County 2007 FIS, using the USACE HEC-HMS computer program.

The study for Tributary 20.25 to Sims Bayou from the upstream side of Highway 8 to just downstream of Maywood St. was taken from the Harris County 2007 FIS.

The 10-, 2-, 1-, 0.2-percent annual chance discharges for the Oyster Creek and Lower Oyster Creek were determined using the USACE HEC-HMS computer program. Rainfall data were obtained from the Fort Bend Drainage Criteria Manual (FBDCM) dated 1999 (Reference 12). No aerial adjustments were made to the point rainfall data. Drainage areas were delineated based on LiDAR topography data collected in 2005. Land use data was developed based on the County GIS data and 2005 aerial imagery. The Green-Ampt loss methodology was used to compute infiltration loss. Clark Unit Hydrograph was used to calculate runoff volume with the time of concentration, $T_{c,}$ and Storage Coefficient R computed using the methodology from the FBDCM. The modified Puls Routing method was used to route hydrographs between model nodes.

The 10-, 2-, 1-, 0.2-percent annual chance discharges for Brazos River was determined by performing a flood frequency analysis on a modified set of the Richmond Gage data in accordance with Bulletin 17B (Reference 13). Frequency analysis assumes a stationary data sequence. Construction of the upstream reservoirs has introduced non-stationary data. Bulletin 17B does not provide guidance when watershed changes have affected the magnitude, homogeneity, or randomness of measured peak discharges. The annual peak discharge data from the USGS Gage at Richmond (Station 0811400) from 1923 to 2004 together with selected historic flood data were utilized as the main component of the flood frequency analysis. Based on the reservoir stage-storage data, the total runoff volume for each event was estimated and relationship was developed between the "regulated" and

"unregulated" flows. Once the recorded flows were converted to "unregulated" flows, flood frequency analysis for the unregulated flows was applied to determine "unregulated" peak flows for different return intervals. The conversion factors used in the prior effective FIS report (dated November 2001) were utilized to convert the "unregulated" flows into "fully regulated" conditions (reference 14).

3.1.2 Redelineated Detailed Study Streams

There is no new hydrology study for the redelineated detailed study streams. The hydrology data for those streams is as described in the Fort Bend County 2001 FIS report and LOMR's documents. Redelineated streams are listed in Table 4.

TABLE 4: REDELINEATED DETAILED STUDY STREAMS

Streams	**FIRM Panel #**	**Stream Profile #**
Clear Creek	48157C0305L, 48157C0310L	20P
Clodine Ditch/Long Point Slough	48157C0110L, 48157C0130L	21P
Coon Creek	48157C0225L, 48157C0240L, 48157C0400L	22P, 23P, 24P
Cow Creek	48157C0500 L, 48157C0575L	25P, 26P
Dry Creek	48157C0240LJ, 48157C0245L, 48157C0265L, 48157C0270L, 48157C0425L	27P, 28P, 29P
Keegans Bayou	48157C0140L, 48157C0145L, 48157C0165L	32P, 33P
Little Prong Buffalo	48157C0105L, 48157C0110L	34P
Long Point Creek	48157C0315L, 48157C0455L	36P
Mustang Bayou	48157C0285L, 48157C0295L, 48157C0305L, 48157C0315L 48157C0270 J	40P, 41P
Red Gully	48157C0140L, 48157C0145L	51P, 52P
Seabourne Creek	48157C0240L, 48157C0245L, 48157C0400L	55P, 56P
Stafford Run	48157C0165L, 48157C0280L, 48157C0285L	57P, 58P
San Bernard River	48157C0200L, 48157C0350L, 48157C0375L, 48157C0500L, 48157C0525L	53P, 54P,
Willow Fork Buffalo Bayou	48157C0040L, 48157C0045L, 48157C0105L, 48157C0110L, 48157C0130L	60P, 61P

For Clear Creek, from Rouen Road to FM 2234, the hydrologic analysis was completed

using the USACE HEC-l computer program (Reference 15). The revised HEC-l analysis, dated August 1991, was included in a report entitled "Clear Creek Regional Flood Control Plan, Hydraulic Baseline Report," prepared by Dannenbaum Engineering Corporation, for the Harris County Flood Control District and Texas Water Development Board, and dated September 1991. The discharges decreased compared to the previous determined discharges as a result of the updated watershed conditions (Reference 16).

The 10-, 2- and 1-percent-annual-chance flood discharges for the lower portion of Clodine Ditch were determined from a synthetic hydrograph analysis developed by Vansickle, Mickelson & Klein, Inc., using the USACE HEC-1 computer program (References 17). The 0.2-percent-annual-chance flood discharges were extrapolated from the values for the lower-frequency floods. Discharges for the upper portion of Clodine Ditch, with a drainage area of less than 5.25 square miles, were determined using USGS Water Resources Investigations 3-73 (Reference 18).

For Keegans Bayou, from upstream of Gaines Road to Belknap Road, the hydrologic analyses were developed from a synthetic hydrograph analysis developed by Turner, Collie & Braden, Inc., using the USACE HEC-1 computer program. Updated hydrologic analysis to reflect existing watershed conditions along Keegans Bayou within the City of Houston and the unincorporated areas of Fort Bend County was completed by RUST Environment and Infrastructure. That work was completed in 2000.

For the 10- and 1-percent-annual-chance floods for Coon Creek, North Branch Dry Creek, Seabourne Creek, and Stafford Run; and the 10-, 2-, and 1-percent-annual-chance floods for Cow Creek, Mustang Bayou, Long Point Creek, and Dry Creek, the regionalized USGS methodology was used to determine the flood flows for the selected recurrence intervals (Reference 19). The 0.2-percent-annual-chance floods for each of these streams were extrapolated from lower frequency values. Drainage areas were determined from USGS topographic maps at a scale of 1:24,000 with a contour interval of 5 feet (Reference 20). For the portion of Dry Creek from the downstream face of Berdett Road to upstream of State Route 36, the 10-, 2-, 1-, and 0.2-percent-annual-chance discharges were determined using USGS Water Resources Investigation 3-73. The 0.2-percent-annual-chance flows were derived by extrapolating the 10-, 2-, and 1-percent-annual-chance discharges on log probability paper.

For Red Gully, the 10-, 2-, 1-, and 0.2-percent-annual-chance discharges were calculated using methodologies developed by the Fort Bend DCM, using the USACE HEC-1 computer program. For the portion of Red Gully in Fort Bend County M.U.D. No. 25, the 10- and 1-percent-annual-chance flows were determined using a regionalized USGS methodology, with drainage areas determined from USGS quadrangle maps. For this portion, 2- and 0.2-percent-annual-chance flows were not calculated.

For the San Bernard River from approximately 10,800 feet upstream of the Atchison, Topeka, and Santa Fe Railway to approximately 3,000 feet upstream of its confluence with Peach Creek, the 10-, 2-, 1-, and 0.2-percent exceedance probabilities were determined by the USACE, Galveston District, for the FEMA under Contract No. EMW-97-IA-0140 (Wharton County, Texas). This work was completed in September 1998. Official records for the San Bernard River show record floods in 1960, 1973, and 1985. Peak discharges for the selected exceedance probabilities were computed using newly published regional

regression equations for the State of Texas by the U.S. Geological Survey (USGS) (Reference 21). The San Bernard River watershed is in Region 11. An urbanization adjustment was not considered on the flooding source because there is currently less than 10% development within the watershed which was determined by field visits and orthographic images.

A flood frequency analysis was performed on the San Bernard River at the gage near Boling, Texas (FM 442) to compare those frequency discharges to the regional regression equations that were used for the detailed analysis. The regression equation discharges were within 3% of the frequency analysis, so the regression equations were used on the San Bernard River.

Peak discharge-drainage area relationships for all flooding sources studied in detail are shown in Table 5, "Summary of Discharges".

Flood elevations were computed by detailed methods for several ponds. These were all incorporated through the LOMR process. Table 6 provides a summary of the elevations.

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
ALCORN BAYOU					
Approximately 0.47 mile upstream of confluence with Brazos River	1.20	*	*	579	*
BRAZOS RIVER					
At the Brazoria / Fort Bend County Line	*	103,000	145,000	162,000	200,000
At US 90A (Richmond Gage)	35,541	103,000	147,000	164,000	202,000
Just upstream of FM 723	*	103,400	148,500	165,700	201,100
Just upstream of FM 1093	*	103,900	150,600	168,000	206,900
At the Waller / Fort Bend County line	*	105,400	153,900	171,700	211,500
BULLHEAD BAYOU					
At US 90A	N/A	*	*	2,191	*
CANE ISLAND BRANCH					
At River Mile 0.0	26.35	3,529	5,874	7,209	10,451
At River Mile 0.9	25.90	3,318	4,498	5,172	6,768
At River Mile 1.2	25.41	3,192	3,794	4,135	4,962

* Data not computed

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
CLEAR CREEK					
Approximately 0.42 mile downstream of State Route 288	6.17	645	891	1049	1230
At FM 2234	5.27	540	825	969	1160
Approximately 0.62 mile upstream of FM 2234	2.82	438	767	951	1160
CLODINE DITCH					
At FM 1093	9.62	797	1157	1287	1650
At Harlem Road	7.33	594	855	962	1240
Approximately 1.35 miles upstream of Harlem Road	5.25	401	577	683	890
COON CREEK					
At Band Road	14.85	1,250	*	2,400	3,750
Approximately 0.28 mile upstream of Southern Pacific Railroad	11.70	1,100	*	2,400	3,750
Approximately 0.29 mile upstream of Cottonwood Road	10.00	1,000	*	1,700	2,450
DRY CREEK					
At Berdett Road	12.5	1,977	2,779	3,356	4,100
At Ricefield Road	9.0	1,693	2,461	2,795	3,650
At FM 2977	8.5	1,644	2,388	2,700	3,500
Approximately 1,180 feet downstream of Bryan Road	3.88	1,150	1,600	1,800	2,400
Approximately 1,920 feet upstream of Bryan Road	3.53	1,050	1,500	1,650	2,000
NORTH BRANCH DRY CREEK					
At confluence with Dry Creek	0.36	193	*	260	295
Approximately 0.46 mile upstream of confluence with Dry Creek	0.31	1.9	*	145	165
KEEGANS BAYOU					
At Keegans Road	8.18	*	*	3,619	*
At the Harris- Fort Bend County Line	5.1	900	*	1,700	3,450
At Belknap Road	3.68	*	*	1,842	*
At Gaines Road	1.88	*	*	600	*

TABLE 5 – SUMMARY OF DISCHARGES - Continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
* Data not computed					
LITTLE PRONG BUFFALO BAYOU SIDE CHANNEL					
At confluence with Willow Fork Buffalo Bayou	8.65	1,377	*	2,340	2,973
At Katy-Gaston Road	6.02	717	*	1,256	1,631
LONG POINT CREEK					
At Briscoe Road	6.56	784	1,062	1,221	1,316
At State Route 6	5.53	817	1,052	1,162	1,304
At Dirt Road	3.00	753	955	1,047	1,160
At Trammel-Fresno Road	1.60	325	447	505	608
Inflow into Pond B1	1.00	204	258	288	342
Outflow out of Pond B1	1.03	185	273	310	382
Inflow into Pond B3	0.86	250	349	397	478
Outflow out of Pond B3	0.94	176	241	274	320
Inflow into Pond B6	0.36	78	111	128	154
Outflow out of Pond B6	0.37	70	97	110	135
Inflow into Pond B7	0.35	82	118	139	171
Outflow out of Pond B7	0.36	75	106	122	147
LONG POINT CREEK EAST FORK					
Approximately 300 ft upstream confluence with Long Point Creek	1.10	101	202	257	439
At Trammel Fresco	0.83	73	90	96	105
MUSTANG BAYOU					
At the downstream county boundary	8.96	779	1,072	1,174	1,448
At the Missouri Pacific Railroad	8.32	758	960	1,120	1,380
Approximately 0.15 mile upstream of Evergreen Road	6.26	682	920	1,010	1,250
Just downstream of the aqueduct	1.77	269**	431**	511**	676**
Just downstream of the confluence of the Mustang Bayou Diversion Channel	1.44	133**	236**	282**	386**
Approximately 0.35 mile downstream of Turtle Creek Drive	0.80	327	456	520	654

TABLE 5 – SUMMARY OF DISCHARGES - Continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
At the upstream Limit of Detailed Study	0.52	193	272	311	394
* Data not computed					
**Decrease due Mustang Bayou Diversion Channel					
MUSTANG BAYOU DIVERSION CHANNEL					
Lake Just upstream of Hermann Hospital	1.71	450	641	727	921
At the confluence with Mustang Bayou	1.18	330	449	503	624
OYSTER CREEK					
At a point approximately 0.63 miles downstream of Lake Olympia Parkway	45.05	3,862	5,743	6,678	8,649
At a point approximately 0.46 miles upstream of Lake Olympia Parkway	43.62	3,382	5,019	5,848	7,598
At a point approximately 0.14 mile upstream of Hampton Drive	41.65	2,609	3,894	4,551	6,138
At Cartwright Road	35.20	1,666	2,498	2,925	3,928
At a point approximately 0.17 mile downstream of Dulles Avenue	34.08	1,301	1,981	2,319	3,162
At a point approximately 0.1 mile upstream of Lexington Boulevard	30.17	892	1,291	1,512	1,981
At US Highway 59	29.71	889	1,297	1,566	2,054
At a point approximately 0.75 miles upstream of US Highway 90A	28.36	727	1,050	1,216	1,532
At a point approximately 0.15 miles upstream of US Highway 90A	27.82	2,085	3,048	3,579	4,684
At a point approximately 0.05 miles downstream of Harman Road	26.22	1,874	2,523	2,876	3,634
At a point approximately 1.12 miles upstream of Harman Road	23.04	1,552	1,703	1,770	1,930
At a point approximately 0.75					

TABLE 5 – SUMMARY OF DISCHARGES - Continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
miles downstream of State Highway 6	22.34	1,791	2,631	2,955	3,518
At State Highway 6	19.30	1,382	2,101	2,452	2,865
OYSTER CREEK continued					
At a point approximately 1.24 miles downstream of State Highway 6	18.77	1,362	2,032	2,365	3,104
At FM 1464	12.21	1,232	2,007	2,433	3,300
At a point approximately 0.7 miles downstream of State Highway 99	10.27	1,171	1,828	2,226	2,808
At State Highway 99	8.43	958	1,506	1,882	2,374
At a point approximately 1.24 miles upstream of Harlem Road	7.00	8.68	1,298	1,637	2,366
At Farmer Street	3.03	492	749	879	1,162
LOWER OYSTER CREEK					
At a point approximately 0.19 miles downstream of McKeever Road	14.66	1,080	1,777	2,143	2,913
At McKeever Road	14.46	1,074	1,767	2,126	2,874
At a point approximately 0.72 miles upstream of McKeever Road	7.24	322	529	633	853
At a point approximately 0.9 miles upstream of McKeever Road	7.11	318	525	629	849
At a point approximately 0.72 miles downstream of Watts Plantation Road	6.97	282	397	449	557
At a point approximately 0.63 miles downstream of Watts Plantation Road	6.30	232	320	361	447
At a point approximately 0.38 miles downstream of Watts Plantation Road	6.19	217	272	295	346
At Watts Plantation Road	5.78	173	208	220	242
At Trammel Fresno Road	5.32	42	61	69	86

TABLE 5 – SUMMARY OF DISCHARGES - Continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
RED GULLY					
At its confluence with Oyster Creek	5.70	1,005	1,368	1,561	2,180
Approximately 2.61 miles upstream of its confluence with Oyster Creek	2.78	450	575	650	900
Approximately 3.50 miles upstream of its confluence with Oyster Creek	2.32	325	490	573	820
SAN BERNARD RIVER					
At FM 442	727	16,100	27,100	32,600	48,000
At downstream confluence with Snake Creek	726	16,106	27,186	32,100	46,800
At downstream confluence with Peach Creek	659	14,855	25,204	29,681	43,400
SEABOURNE CREEK					
Just upstream of J. Meyer Road	6.79	936	1,408	1,632	2,108
Approximately 0.56 mile downstream of State Route 36	5.69	821	1,227	1,396	1,762
Just downstream of State Route 36	4.39	604	881	1,004	1,313
Approximately 0.29 mile upstream of State Route 59	2.41	550	*	900	1,200
Approximately 0.13 mile upstream of Southern Pacific Railroad	1.75	460	*	710	840
At Old US Route 59	0.99	125	*	220	350
At Scott Road	0.39	54	*	95	120
SNAKE CREEK					
At confluence with Willow Fork Bayou	12.15	1,132[1]	1,789[1]	2,148[1]	4,178[1]
SNAKE SLOUGH					
Approximately 600 feet downstream of Hagerson Road	0.41	*	*	297	*

[1] Reduced discharges are due to overflow into Cane Island Watershed and storage routing effects.
* Data not computed

TABLE 5 – SUMMARY OF DISCHARGES - Continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
STAFFORD RUN					
At confluence with Oyster Creek	5.18	1,086	1,899	2,218	3,548
Downstream of detention ponds	4.21	954	1,588	1,889	3,162
Upstream of detention ponds	4.00	2,380	3,313	3,816	5,011
At System A Canal	2.90	1,807	2,484	2,787	3,311
At Brand Road	0.32	366	435	550	661
STEEP BANK CREEK					
Approximately 1.1 miles upstream of confluence with Snake Slough	1.60	*	*	1,491	*
WILLOW FORK BUFFALO BAYOU					
Approximately 1.59 miles downstream of the confluence of Little Prong Buffalo Bayou	82.89	8,000	*	14,500	22,000
Approximately 0.19 miles upstream of the confluence of Little Prong Buffalo Bayou	66.01	6,600	*	11,700	17,500
Approximately 1.03 miles downstream of Greenbush Road	59.95	6,050	*	11,100	16,000
Approximately 0.21 miles upstream of Greenbush Road	58.58	6,000	*	11,000	15,850
Approximately 1 mile downstream of Crossover Road	54.48	5,700	*	10,400	14,200
Approximately 0.26 mile downstream of FM 1463	43.38	5,600	*	7,000	10,000
Approximately 0.46 mile upstream of FM 1463	20.34	2,319	*	3,654	4,587
Approximately 1.00 mile upstream of FM 1463	18.32	2,121	*	3,326	4,168
Approximately 2.06 mile upstream of FM 1463	13.35	1,492	*	2,213	2,717
WILLOW FORK DIVERSION CHANNEL					
At divergence from Willow Fork Buffalo Bayou	*	4,500	6,335	7,810	9,370

* Data not computed

TABLE 6– SUMMARY OF STILLWATER ELEVATIONS

Flooding Source And Location	Elevation (ft) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1.0-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Alcorn Bayou				
AB Lake A1	*	*	65.1	*
AB Lake A2	*	*	65.1	*
Barker Reservoir	93.8	96.4	97.2	99.0
Brazos River				
West WWTP Interior Drainage	*	*	76.7	*
LID No. 11 Interior Drainage	*	*	68.2	*
Diversion Channel Interior Lakes	*	*	68.2	*
LID No. 17 Interior Drainage				
Main Lake Storage Reservoir	*	*	65.5	*
Tract 5	*	*	68.8	*
LID No. 20 Interior Drainage				
Lake 1	*	*	88.5[1]	*
Lake 2	*	*	88.5[1]	*
Lake 3	*	*	88.5[1]	*
Lake 4	*	*	88.5[1]	*
Lake 5	*	*	88.5[1]	*
Longpoint Creek East Fork				
Pond A	67.88	70.03	70.84	72.46
Pond B	67.86	67.00	70.80	72.39
Pond C	67.91	69.71	70.45	71.76
Pond D	67.72	69.75	70.48	71.79
Snake Slough				
SS Lake 1	*	*	64.9	*
Steep Bank Creek				
Riverstone Pond	*	*	64.6	*
SB Lake 81	*	*	64.0	*
SB Lake 82	*	*	63.6	*
SB Lake 83	*	*	63.6	*
SB Pond F	*	*	63.9	*

* Data not computed

[1] Elevation computed using combined probability analysis with Brazos River

3.1.3 Enhanced Approximate Study Streams

In this study, approximately 294 miles of the effective approximate floodplain boundaries were restudied by using the Enhanced Approximate method. ArcHydro Tools were used to derive the contributing drainage areas and appropriate flow change locations (Reference 22). Flows for the 1-percent annual chance flood event were calculated using the USGS regression equation (Reference 23). Fort Bend County is located in Region 11 of Texas and consequently has only one regression equation valid for watersheds of all sizes. The equation is as follows:

$$Q_{100} = 213*(A^{0.755})*(SL^{0.442})$$

Where:

Q_{100} = 1-percent annual chance discharge (cubic feet per second -cfs)
A = Contributing Drainage Area (square mile)
SL = Stream Slope (feet per mile)

Enhanced Approximate Study streams are described on Table 7.

TABLE 7: ENHANCED APPROXIMATE STUDY STREAMS

Flooding Streams	**Downstream Location**	**Upstream Location**
Bessies Creek	Confluence with Brazos River	Fort Bend/Waller County Line
Big Creek	Confluence with Brazos River	Confluence of Cottonwood and Coon Creeks
Brooks Branch	Confluence with San Bernard River	Limit of Approximate Study
Bullhead Bayou	Harlem Road	Pecan Grove M.U.D.
Cedar Creek	Fort Bend/Brazoria County Line	Bushnell Road
Coon Creek	Limit of Detailed Study	US Highway 90A
Cottonwood Creek	Confluence with Big Creek	Limit of Approximate Study
Dry Creek	Smithers Lake	Limit of Detailed Study
Flewellen Creek	Confluence with Jones Creek	FM 359
Foss Creek	Confluence with Big Creek	Limit of Approximate Study
Jones Creek	Confluence with Brazos River	Montgomery Road
Rabbs Bayou	Limit of Brazos River Detailed Study	Limit of Approximate Study
San Bernard River	Fort Bend/Brazoria County Line	Fort Bend/Austin County Line
Sandy Branch	Confluence with Brazos River	Limit of Approximate Study
Seabourne Creek	Confluence with Big Creek	Limit of Detailed Study
Snake Creek	Confluence with San Bernard River	FM 1952
Turkey Creek	Confluence with San Bernard River	US Highway 90A

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.2.1 New Detailed Study Streams

Cross section data for the new detailed analyses of the Brazos River, Oyster Creek, and Lower Oyster Creek were obtained from the combination of field surveyed data within the channels, and LIDAR topography collected in 2005 for the overbanks. USACE HEC-RAS and HEC-GeoRAS computer programs (References 24 and 25) were used as the main hydraulics tools to compute the floodplain elevations and generate the floodplain boundaries. Manning's n values were estimated based on field investigations, field pictures, and aerial photography. The n-values and expansion and contraction coefficients followed recommendations set forth in the USACE HEC- RAS Hydraulic Reference Manual. Ineffective flow areas were carefully analyzed and included as needed at bridges and culverts.

For the Oyster Creek and Lower Oyster Creek studies, eighty four (84) cross-section channels and 53 hydraulics structures were field surveyed. There was no recorded high water mark for calibration of the hydraulics models. The hydraulics models were validated through comparison with the previous FIS study (1977), the Upper and Middle Oyster Creek study by Brown & Gay (BGE) and Costello (2002), and the Missouri City Drainage Master Plan update by Dodson & Associates (2001).

For the Brazos River study, fifty five (55) valley cross-section channels, 10 hydraulics structures, and 5 levee cross sections were field surveyed. Approximately thirty (30) interpolated cross sections were added the hydraulics model to reflect the bridge expansion and contraction; the beginning and the end of the levees; and the significant distance between two surveyed cross sections. The hydraulic model was calibrated against the 1991, 1994, and 1998 flooding events, and validated against the 2007 high flow event. Certified levees along the Brazos River were considered operational in the hydraulic modes.

For Cane Island Branch, Clear Creek (from FM 2234 to the Harris and Fort Bend County line), and Keegan Bayou (from Belknap Road to the Harris and Fort Bend County line); hydraulics analyses were developed as parts of the Harris County 2007 FIS, using the USACE HEC-RAS computer program (Reference 26).

3.2.2 Redelineated Detailed Study Streams

Base Flood Elevations from the 2001 FIS report and LOMR's issued for redelineation streams were used to redelineate the floodplain on the 2005 LiDAR data. In the process of redelineation mapping, there have been overlaps of floodplain information and LOMR's coverage across the county lines of Fort Bend and its adjacent counties (Harris, Waller, and Brazoria). In those overlapping areas, the latest information was utilized to create a seamless floodplain across the county lines. It should be noted that some inconsistencies may still remain; a new derailed study of the entire watershed will be required to clarify all issues.

Fort Bend County has experienced subsidence in the northeast part of the county. The 2001 floodplain was mapped based on the vertical datum of NGVD 1929, 1973 adjustment. For this revision, the vertical datum was converted to NAVD 1988. Datum conversion between NGVD 1929 and NAVD 1988 was considered minor. To avoid a significant discontinuity at the county boundary, subsidence for only those streams that continue into a downstream county were taken into account in the adjustment of the BFE's. The subsidence adjustments are based on published data from Harris Galveston Coastal Subsidence District (HGCSD) and National Geodetic Survey (NGS). Table 8 provides the adjustment values used in the redelineation mapping process.

TABLE 8: SUBSIDENCE ADJUSTMENT VALUES FOR REDELINEATED STREAMS

Redelineated Streams	Adjustment (ft)	Adjusted Profiles
Willow Fork Buffalo Bayou	-1.0	65P
Willow Fork Diversion Channel	-1.0	68P
Clodine Ditch/Long Point Slough	-1.0	23P
Red Gully	-1.5	53P
	-1.0	54P
Stafford Run	-2.5	62P
	-2.0	63P
Clear Creek	-2.5	22P
Keegans Bayou	-1.5	34P
Mustang Bayou	-2.0	42P
	-1.0	43P
Mustang Bayou Diversion Channel	-1.0	44P
Long Point Creek	-1.5	38P
Long Point Creek East Fork	-1.5	39P

In the original studies, cross section data for the redelineation streams were obtained from USGS topographic maps; third order leveling was used for Stafford Run, Dry Creek, North Branch Dry Creek, and Seabourne Creek. Cross sections were located at close intervals upstream and downstream of bridges and culverts in order to compute the significant backwater effects of these structures. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 and/or HEC-RAS step-backwater computer programs. The hydraulic analyses were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail

In the original studies, starting water-surface elevations for the streams studied by detailed methods, except for Willow Fork Buffalo Bayou and North Branch Dry Creek, were calculated by the slope/area method. Starting water-surface elevations for Willow Fork Buffalo Bayou were obtained by critical depth computations. Starting water-surface elevations for North Branch Dry Creek were based on coincident peak with Dry Creek.

Approximate water-surface elevations for Bessies Creek were obtained from normal depth computations. For Long Point Creek, Brookshire Creek, Dry Creek, and Rabbs Bayou, approximate water-surface elevations were obtained from average depth computations. For Jones Creek, approximate water-surface elevations were calculated by the slope/area method.

The hydraulics analysis for Clear Creek was prepared by Dannenbaum Engineering Corporation, dated October 28, 1991, using the USACE HEC-2 computer program. Cross sections for the backwater analysis were obtained from field surveys, highway plans, and aerial photographs. Roughness coefficients (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and based on field observations of the stream and floodplain areas.

Analyses of hydraulic characteristics of the San Bernard River were performed by the USACE, Galveston District, dated September 1998. The analyses provide predicted water-surface elevations of floods of the selected exceedance probabilities. Water surface elevations of the 10, 2, 1, 0.2 % exceedance probabilities were computed using the USACE HEC-RAS computer program (Reference 27). Channel sections were obtained by field surveys and the valley sections were taken from the USGS quadrangle maps at a scale of 1:24,000 with a contour interval of 5 feet. Roughness coefficients were estimated for the stream channel and floodplain areas on the basis of field inspections (Reference 28) and orthographic images. The channel roughness coefficient was determined to be 0.07, while overbank roughness coefficients ranged from 0.06 to 0.09. Starting water surface elevations were determined by using normal depth calculations and assuming the slope of the energy grade line equal to the slope of the channel bottom.

Channel and overbank roughness coefficients for the detailed study streams are listed in Table 9.

TABLE 9: SUMARY OF ROUGHNESS COEFFICIENTS

Detailed Study Streams	Channel "n"	Overbank "n"
Brazos River	0.030-0.044	0.050-0.120
Cane Island Branch	0.040-0.050	0.060-0.200
Clear Creek	0.013-0.081	0.050-0.015
Clodine Ditch/Long point Slough	0.015-0.035	0.070
Coon Creek	0.040-0.070	0.057-0.100
Cow Creek	0.045-0.055	0.057-0.100
Dry Creek	0.035-0.045	0.050-0.075
North Branch Dry Creek	0.030-0.050	0.060-0.180
Keegans Bayou	0.040-0.150	0.080-0.150
Little Prong Buffalo Bayou	0.50	0.120
Long Point Creek	0.060	0.120-0.140
Long Point Creek East Fork	0.060	0.120
Lower Oyster Creek	0.040	0.050-0.090
Mustang Bayou	0.060-0.065	0.120-0.130
Oyster Creek	0.040	0.050-0.100
Red Gully	0.035-0.050	0.120
Seabourne Creek	0.040-0.050	0.060
Stafford Run	0.032-0.040	0.060-0.100
Willow Fork Buffalo Bayou	0.040-0.050	0.120
Willow Fork Diversion Channel	0.015-0.035	0.120

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and are shown on the Digital Flood Insurance Rate Map (DFIRM). The locations of the NGS bench marks are shown on the maps.

3.2.3 Enhanced Approximate Study Streams

The 1-percent annual chance water surface elevations of enhanced approximate study streams were determined by using USACE HEC-RAS computer program (Reference 24). Cross sections for enhanced approximate study streams were obtained from the 2005 LiDAR data. The cross sections were located approximately every 1,500 feet along the stream centerline and all cross sections were oriented perpendicular to the stream flow. The normal depth starting water surface condition was used to initiate the hydraulic computations. No hydraulic structures were included in the study.

Most of studied streams are located in rural areas. Based on aerial imagery of the area and field reconnaissance information, the overbank roughness coefficients were set between

0.06-0.08. The channels were found to be fairly clean and straight with some vegetation and were assigned a roughness coefficient of 0.035.

Based on the 1-percent annual chance water surface elevations generated by the HEC-RAS models and the LiDAR topographic data, USACE HEC-GeoRAS computer program was used to delineate an initial floodplain boundary. The initial floodplain boundary was then revised and updated to remove areas of inundation that were unrealistic due to lack of hydraulic connectivity and to ensure the overall validity of the floodplain boundaries with respect to local topography.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

The 2001 floodplain was mapped based on the vertical datum of NGVD, 1973 adjustments. Flood elevations shown in this FIS report and on the DFIRM are referenced to the NAVD (2001 adjustment). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. The datum conversion factor from NGVD to NAVD in Fort Bend County was -0.014.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey (NGS) website at www.ngs.noaa.gov, or contact the NGS at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910-3282

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

3.4 Land Subsidence

Base flood elevations for most of the flooding sources shown on the DFIRM and in this report were initially developed using benchmarks referenced to the NGVD. Fort Bend County and Incorporated Areas are affected by land subsidence. Land subsidence is the lowering of the ground as a result of water, oil, and gas extraction, as well as other phenomena such as soil compaction, decomposition of organic material, and tectonic movement. Due to the presence of land subsidence, some or all of the benchmarks used to develop the base flood elevations on the FIRM have subsided.

Periodically, the NGS relevels some benchmarks to determine new elevations above the NGVD; however, not all benchmarks are releveled each time. Releveling in Fort Bend County was conducted in 1973, 1979, and 1987. The survey for the 2001 FIS for Fort Bend County was conducted in 1978 using many benchmarks that were established prior to 1973 and may or may not have been releveled in 1973 or later.

The Fort Bend Subsidence District **(**FB District**)** was created by the Texas Legislature in 1989 as a conservation and reclamation district (Act of May 26, 1989, 71st Leg., R.S., ch. 1045, 1989 Tex. Gen. Laws 4251). The District's purpose is to provide for the regulation of the withdrawal of groundwater within the District to prevent subsidence that contributes to flooding, inundation or overflow of areas within the District, including rising waters resulting from storms or hurricanes, The District's boundaries are defined as all the territory within Fort Bend County (Reference 29).

Currently, total water use in the FB District is comprised of 60% groundwater and 40% surface water; the surface water, however, is primarily used for manufacturing and agricultural uses. The FB District was formed to address measured impacts from the predominant use of groundwater. In addition to the moderate, but noticeable, amounts of subsidence, the heavy dependence of groundwater has resulted in declining water levels in wells in the aquifers. Groundwater levels in wells drawing from the Chicot and Evangeline Aquifers in the eastern part of the District have declined in excess of of 150 feet from 1943 to 1977. These declines have resulted in increased operational costs to well users.

The Harris-Galveston Coastal Subsidence District (H-GCSD) was created by the Texas Legislature in 1975 as an underground water conservation district for the purpose of controlling subsidence. In 2000, the H-GCSD and NGS conducted a major re-leveling effort in 9-county area (Harris, Fort Bend, Galveston, Brazoria, Waller, Montgomery, Liberty, and Chamber Counties), mostly in Harris County. Updated elevations were established on 181 benchmarks with approximate 25 benchmarks within Fort Bend County. Figure 1 shows the NGS-HGCSD bench marks.

The datum of this network is NAVD 1988 with a vertical height adjustment to 2000. The subsidence map of Harris County from 1973 to 2000 in the Tropical Storm Allison Recovery Project (TSARP) was used to develop the subsidence adjustment values. The recommended values from Table 8 were primarily used in the redelineation mapping process. However, for Stafford Run and Mustang Bayou, the subsidence adjustment values were revised to obtain a more accurate floodplain map. The revised values were based on engineering analysis of the difference between the redelineation map and the 2001 FIRM's. Figure 2 shows the subsidence adjustment values from 1973 to 2000. There is no vertical height adjustment from 2000 to 2001.

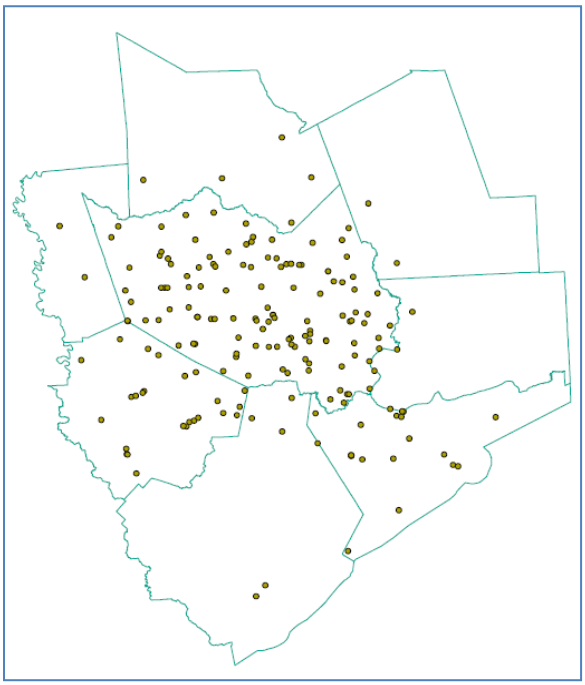


Figure 1: NGS-HGCSD Benchmarks

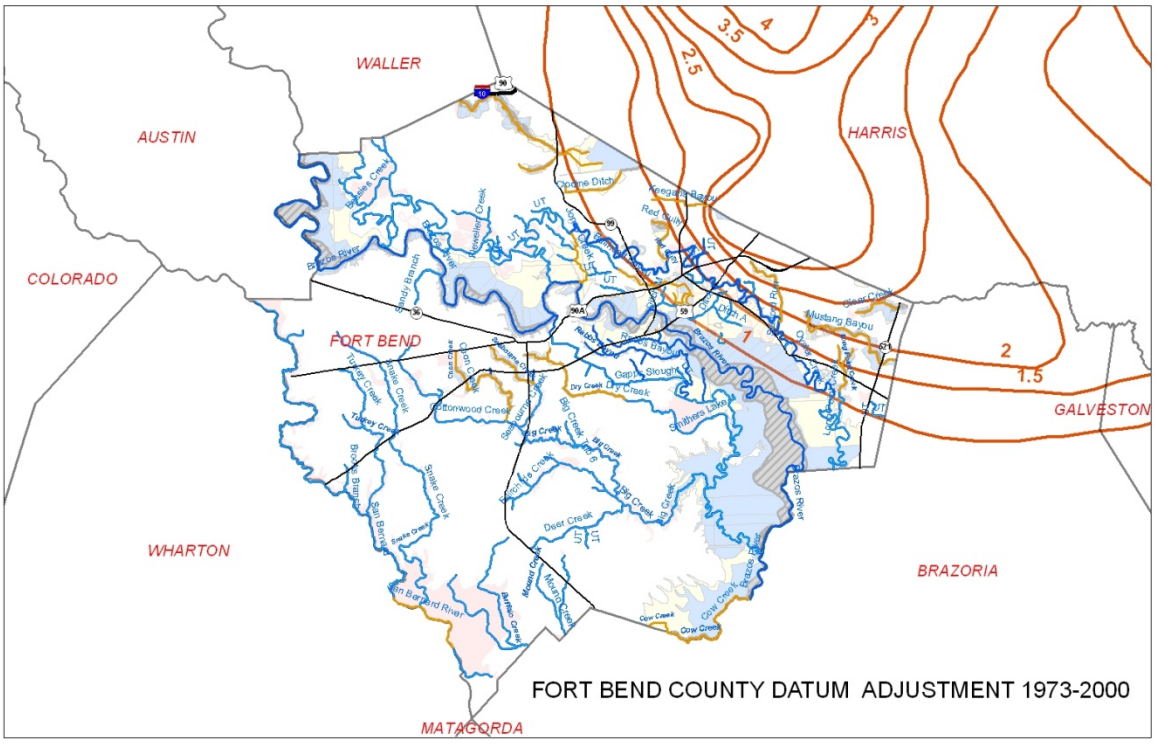


Figure 2: Fort Bend Subsidence Adjustment Values from 1973 to 2000

The prevalence of land subsidence in the study area complicates the determination of the amount a given property lies above or below the base flood elevation. Complicating factors include determining which benchmark releveling to use to determine a property elevation and possible changes in flood hazards as a result of subsidence. Changes in flood hazards, caused by changed hydrologic and hydraulic conditions, could include increases or decreases in (1) depths of flooding, and (2) the amount of land inundated.

A study of subsidence was undertaken by the local entities primarily responsible for water supply and subsidence and flood control in the Houston metropolitan area - Fort Bend County Drainage District, Harris County Flood Control District (HCFCD), Harris-Galveston Coastal Subsidence District (H-GCSD), and the City of Houston. The study, dated December 1986, is entitled "A Study of the Relationship between Subsidence and Flooding" (Reference 30). The effects of subsidence on flooding are discussed below.

Subsidence within inland watersheds has little or no effect on flood depths when the entire watershed, including all hydraulic structures, subsides uniformly. However, differential subsidence (the presence of differing amounts of subsidence within a watershed) can cause changes in stream-channel slope and stream-valley geometry, which can result in changes in flood depths. Where stream-channel slopes are steepened (where there is more subsidence downstream than upstream), flood discharges usually increase and hydraulic efficiency, as measured by the amount of discharge for a given flood depth, increases. In this situation, the depth of flow usually decreases. The opposite is generally true where stream-channel slopes are flattened.

Other effects of land subsidence can include changes in cross-section floodplain geometry and changes in drainage-basin boundaries. Changes in cross-section geometry can affect conveyance, overbank storage, and flow diversions and result in localized changes in flood hazards. Changes in drainage basin boundaries affect the size of the drainage area and can result in changes in discharges and flood depths in the altered basins.

Fort Bend County and Incorporated Areas are affected by relatively wide-scale, uniform subsidence with minor differential subsidence within individual watersheds. Flood depths remain relatively constant and base flood elevations generally subside as the ground subsides (see Figure 3). The local effects of subsidence may be adequately addressed, in the short term, by assuming that base flood elevations subside by the same amount the ground subsides. For floodplain management (setting lowest-floor elevations and regulating construction in the floodplain) and flood insurance (determining the amount the lowest floor of a structure lies above or below the base flood elevation) purposes, the effects of subsidence can be accounted for by determining ground and structure elevations using benchmark elevations with the same relevel date as the benchmarks used to develop the base flood elevations on the FIRM. No adjustment is necessary to the base flood elevations on the FIRM.

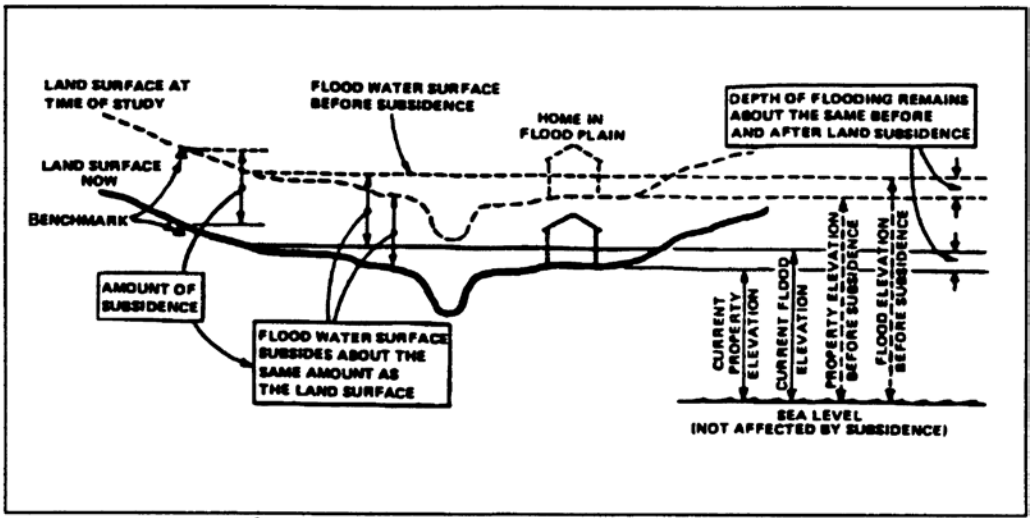


Figure 3: Land Subsidence Schematic

When reviewing development permit applications for new construction in areas subject to ongoing subsidence, consideration should be given to setting the lowest-floor elevation above the base flood elevation by an amount associated with potential increases in flood depths as a result of past and future subsidence. In the absence of site-specific engineering data, elevating a structure by an additional 0.5 foot above the base flood elevation is recommended at this time. This recommendation is based on information on potential increases in flood depths due to worst-case scenarios of predicted future differential subsidence as discussed in the report entitled "A Study of the Relationship between Subsidence and Flooding." Alternatively, the elevations of more recent releveling of benchmarks, including the 2000 releveling, could be used for ground surveying in setting lowest-floor elevations with the base flood elevations shown on the FIRM.

In watersheds where minor differential subsidence can be considered negligible in the short term, greater differentials in subsidence may occur over time and uniform subsidence assumptions may no longer be appropriate. Additionally, local conditions may produce changes in ground elevations that cannot always be predicted. As a result, more uncertainty is introduced with respect to potential changes in flood depth. The useful life of a FIS is limited and the FIS must eventually be updated. When an entire watershed, or large portions of a watershed, is restudied and the effects of differential subsidence may be significant, it may be appropriate to relevel benchmark elevations at that time, or use the most recently releveled benchmark elevations. The new or more recent benchmark elevations should be used for developing new topography and new cross-section data for hydrologic and hydraulic models.

Information regarding the location and amount of subsidence is available from the H-GCSD in Friendswood, Texas, and the FB Subsidence District in Richmond, Texas. Subsidence information is available for periods of record including 1906-1943, 1943-1964, 1964-1973, 1973-1978, 1978-1987, 1987-1995, and 1995-2000. In areas affected by subsidence, benchmarks that have been installed with the foundation of the benchmark deep in the ground on a nonsubsiding subterranean layer may provide stable benchmark elevations even though the surrounding ground is subsiding. Several of these types of benchmarks, referred to as "extensometers," are located within Harris County and

Incorporated Areas. Information concerning the location and stability of these benchmarks may be obtained from the H-GCSD.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 100-year floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2- percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (l00-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections of new detailed study streams, the boundaries were interpolated using topographic maps at a scale of 1:12,000, with a contour interval of 2 feet. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1inch=1,000 feet, with a contour interval of 2 feet (Reference 31).

The 1-percent and 0.2-percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards Zones A, AE, AO, and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by enhanced approximate study methods, the boundaries of the 1-percent annual chance floodplain were delineated using USACE HEC-GeoRAS computer program. The floodplain boundary widths increased in some areas and decreased in others. The reductions in inundated area were found in floodplain area due to channelization or channel improvements. The increase in floodplain areas were found in the flat regions of the Fort Bend County, especially in the southwest area. This increase in inundated area was minimized in mapping by using depth analysis to eliminate shallow flooding areas with weak hydraulic connections to the main stream channel.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the

encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of these computations are tabulated at selected cross sections (see Table 10, "Floodway Data"). In cases where the floodway and 1-percent annual chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

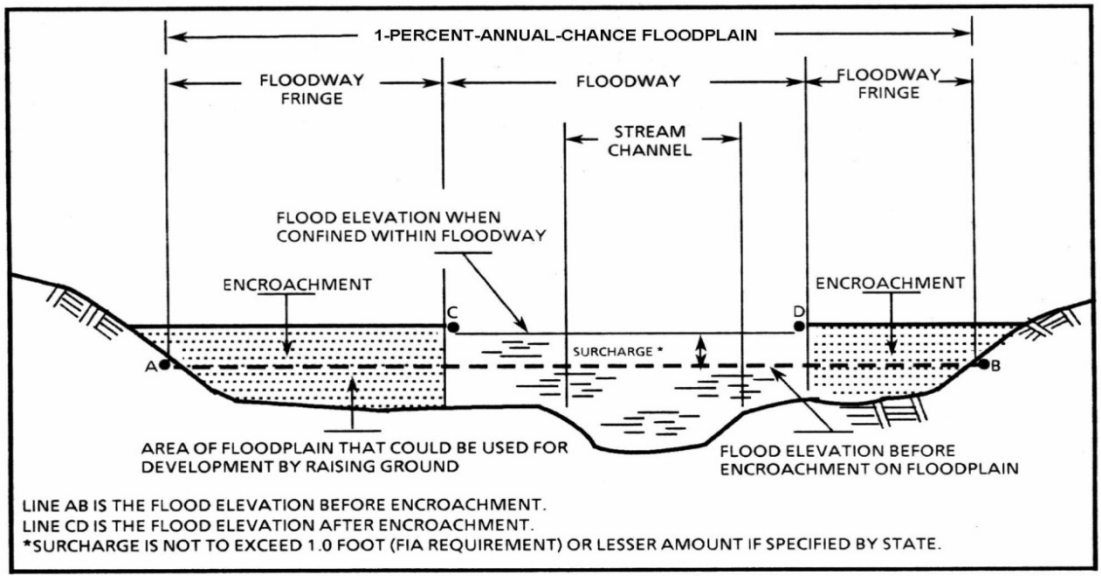


Figure 4: Floodway Schematic

Portions of the floodway widths for the Brazos River, Cow Creek, and Willow Fork Buffalo Bayou extend beyond the county boundary. A floodway was not computed for Willow Fork Diversion Channel.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 10 for certain downstream cross sections of Cow Creek are lower than the regulatory flood elevations in that area, which must take into account the 1-percent-annual-chance flooding due to backwater from other sources.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	**DISTANCE[1]**	**WIDTH (FEET)**	**SECTION AREA (SQUARE FEET)**	**MEAN VELOCITY (FEET PER SECOND)**	**REGULATORY (FEET NAVD)**	**WITHOUT FLOODWAY (FEET NAVD)**	**WITH FLOODWAY (FEET NAVD)**	**INCREASE (FEET)**
					FEET (NAVD)			
Tributary 20.25 to Sims Bayou								
A-K[2]								
L	8,871	149	979	4.2	60.1	60.1	60.7	0.6
M	9,417	158	922	4.4	60.4	60.4	61.3	0.9

[1] Feet above confluence with Galveston Bay
[2] Cross Sections A through K are located in Harris County

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY
FORT BEND COUNTY, TEXAS AND INCORPORATED AREAS

FLOODWAY DATA

C147-02-00

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 foot and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 sq. mi., and areas protected from the 1.0-percent flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies. For floodplain management applications, the map shows by tints, screens, and symbols, the 1-percent and 0.2-percent-annual-chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Fort Bend County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. Historical data relating to the maps prepared for each community are presented in Table 11, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE
FIRST COLONY L.I.D. [2]	July 9, 1976	December 20, 1977	November 19, 1987	
FORT BEND COUNTY L.I.D. NO. 2	March 17, 1981	None	February 15, 1985	
FORT BEND COUNTY L.I.D. NO. 7 [1]	July 9, 1976	December 20, 1977	August 5, 1986	May 3, 1990
FORT BEND COUNTY M.U.D NO. 2	March 11, 1977	None	November 15, 1984	
FORT BEND COUNTY M.U.D NO. 25	July 19, 1976	December 20, 1977	February 4, 1987	
FORT BEND COUNTY M.U.D NO. 34 [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
FORT BEND COUNTY M.U.D NO. 35 [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
FORT BEND COUNTY M.U.D NO. 41 [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
FORT BEND COUNTY M.U.D NO. 42 [3]	January 17, 1975	October 25, 1977	January 6, 1982	December 17, 1987
FORT BEND COUNTY M.U.D. NO. 23	June 11, 1985	None	August 5, 1986	

[1] Dates for this community are those of the Fort Bend County Unincorporated Areas

[2] The area of this community was previously shown on the FIRM as unincorporated areas of Fort Bend County and was not identified as a separate NFIP community until November 19, 1987 Therefore, the earlier dates for this community are those of the unincorporatd areas of Fort Bend County.

[3] The area of this community was previously shown on the FIRM as a part of the City of Missouri City and was not identified as a separate NFIP community until April 2, 2014. Therefore, the earlier dates for this community are those of the City of Missouri City.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE
ARCOLA, CITY OF [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
FAIRCHILDS, VILLAGE OF [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
FULSHEAR, CITY OF [2]	July 9, 1976	December 20, 1977	August 19, 1987	
KENDLETON, CITY OF	April 29, 1980	None	September 30, 1992	
KINGSBRIDGE M.U.D. [1]	July 9, 1976	December 20, 1977	August 5, 1986	
MISSOURI CITY, CITY OF	January 17, 1975	October 25, 1977	January 6, 1982	December 17, 1987
NEEDVILLE, CITY OF [3]	July 9, 1976	December 20, 1977	March 4, 1987	
PECAN GROVE M.U.D.	November 1, 1977	May 1, 1979	August 4, 1987	

[1] Dates for this community are those of the Fort Bend County Unincorporated Areas

[2] The area of this community was previously shown on the FIRM as unincorporated areas of Fort Bend County and was not identified as a separate NFIP community until August 19, 1987 Therefore, the earlier dates for this community are those of the unincorporated areas of Fort Bend County.

[3] The area of this community was previously shown on the FIRM as unincorporated areas of Fort Bend County and was not identified as a separate NFIP community until March 4, 1987 Therefore, the earlier dates for this community are those of the unincorporated areas of Fort Bend County.

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

FORT BEND COUNTY, TX
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE
BEASLEY, CITY OF [1 & 2]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
PLEAK, VILLAGE OF [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
RICHMOND, CITY OF	June 28, 1974	August 22, 1975	March 1, 1982	August 4, 1987
ROSENBERG, CITY OF	June 28, 1974	August 22, 1975	December 4, 1984	May 17, 1990
SIMONTON, CITY OF	August 4, 1987	None	August 4, 1987	
STAFFORD, CITY OF	March 1, 1982	None	March 1, 1982	
SUGAR LAND, CITY OF	May 31, 1974	August 22, 1975	November 4, 1981	October 16, 1987
THOMPSONS, TOWN OF [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
WEST KEEGANS BAYOU IMPROVEMENT DISTRICT [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
WILLOW FORK DRAINAGE DISTRICT [1]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990

[1] Dates for this community are those of the Fort Bend County Unincorporated Areas
[2] No Special Flood Hazard Areas identified within Fort Bend County

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE
UNINCORPORATED AREAS	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
BIG OAKS M.U.D. [1]	November 29, 1985	None	August 5, 1986	
CHELFORD CITY M.U.D.[1]	January 3, 1997	None	January 3, 1997	
MISSION BEND M.U.D. NO. 1 [1, 2]	July 9, 1976	December 20, 1977	August 5, 1986	September 4, 1987
FORT BEND COUNTY M.U.D. NO. 30[1]	July 9, 1976	None	January 3, 1997	
MEADOWS PLACE, CITY OF[1]	September 30, 1992	None	September 30, 1992	
ORCHARD, CITY OF[1 & 2]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990
HOUSTON, CITY OF [2]	December 27, 1974	April 8, 1977	December 31, 1974	December 11, 1979 September 21, 1982 September 27, 1985 September 4, 1987
KATY, CITY OF [2]	June 28, 1974	July 9, 1976 January 24, 1978	March 2, 1981	February 8, 1983
PEARLAND, CITY OF [2]	January 31, 1975	August 13, 1976	July 5, 1984	
WESTON LAKES, CITY OF [2]	July 9, 1976	December 20, 1977	August 5, 1986	June 3, 1988 May 3, 1990 June 18, 1990

[1]No Special Flood Hazard Areas identified within Fort Bend County

[2] Dates for this community are those of the Fort Bend County Unincorporated Areas

TABLE 11

FEDERAL EMERGENCY MANAGEMENT AGENCY

FORT BEND COUNTY, TX
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

There are no other known studies underway in Fort Bend County. There are ongoing and completed Flood Insurance Studies in adjacent counties: Harris, Waller, Austin, Brazoria, and Wharton. This FIS report is in agreement with FIS data from those counties. This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA Region VI, Federal Insurance and Mitigation Division, 800 North Loop 288, Denton, Texas 76209.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency. Flood Insurance Study, Harris County, Texas and Incorporated Areas, Washington, D.C., June 18, 2007

2. Federal Emergency Management Agency. Flood Insurance Study, City of Rosenberg, Fort Bend County, Texas, Washington, D.C., May 17, 1990.

3. Wikipedia, the free encyclopedia - http://en.wikipedia.org/wiki/Fort_Bend_County,_Texas

4. Handbook of Texas Online - http://www.tshaonline.org/handbook/online/articles/FF/hcf7.html#

5. Flood Safety - http://www.floodsafety.com/texas/documentaries/d1991/index.htm

6. National Weather Service Forecast Office – Houston/Galveston, Texas - http://www.srh.noaa.gov/hgx/severe/events/october.htm

7. Wikipedia, the free encyclopedia - http://en.wikipedia.org/wiki/Tropical_Storm_Frances_%281998%29

8. Turner, Collie & Braden, Inc., Modification of Flood Hazard Boundary Map, Sheet 13, Fort Bend County, Texas (Unincorporated Area), Houston, Texas, February 1984.

9. FEMA Procedure Memorandum 32- Levee Review Protocol - http://www.fema.gov/library/viewRecord.do?id=2270

10. FEMA Procedure Memorandum 34- Interim Guidance for Studies Including Levees - http://www.fema.gov/library/viewRecord.do?id=2367

11. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-HMS Hydrologic Modeling System, Version 2.1.1, Davis, California, January 2001.

12. Espey, Huston & Associates, Inc., Fort Bend County Drainage Criteria Manual, Fort Bend County, Texas, revised April, 1999.

13. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981.

14. Espey, Huston & Associates, Inc., Reassessment of 100-Year Peak Flow, Brazos River at Richmond, Texas, Austin, Texas, May 1984.

15. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Generalized Computer Program, Davis, California, September 1990.

16. Dannenbaum Engineering Corporation, Clear Creek Regional Flood Control Plan, Hydraulic Baseline Report, prepared for Harris County Flood Control District and Texas Water Development Board, July 1990, Revised September 1991.

17. Vansickle, Mickelson, and Klein, Inc., Clodine Ditch, Long Point Slough, Letter of Map Revision Request, Volumes 1-3, Houston, Texas, July 1988.

18. U.S. Department of the Interior, Geological Survey, Water Resource. Investigations 3-73, Effects of Urbanization on Floods in the Houston, Texas, Metropolitan Area by Steven L. Johnson and Douglas M. Sayre, April 1973.

19. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 77-110, Technique for Estimating the Magnitude and Frequency of Floods in Texas by E.E. Schroeder and B.C. Massey, 1977.

20. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet: Wallis, Texas, 1960; Fulshear, Texas, 1971; Richmond Northeast, Texas, 1971; Clodine, Texas, 1970; Alief, Texas, 1970; Katy, Texas, 1971; East Bernard, Texas 1960; Orchard, Texas, 1971; Richmond, Texas, 1971; Sugar Land, Texas, 1970; Missouri City, Texas, 1970; Almeda, Texas, 1915-1954; Hungerford, Texas, 1953; Kendleton, Texas, 1953; Needville, Texas, 1953, photorevised 1971; Lake George, Texas, 1953;Thompsons, Texas, 1953; Juliff, Texas, 19431963; Boling, Texas, 1953; Guy, Texas, 1953; Damon, Texas, 1953: Otey, Texas, 1953.

21. U.S. Geological Survey, Regional Equations for Estimation of Peak-Streamflow Frequency for Natural Basins in Texas, Water Resources Investigations Report 96-4307, 1997.

22. ESRI – Arc Hydro - http://support.esri.com/index.cfm?fa=downloads.datamodels.filteredgateway&dmid=15,

23. U.S. Department of the Interior, Geological Survey, The National Flood-Frequency Program – Methods for Estimating Flood Magnitude and Frequency for Natural Basins in Texas, 2001 – U.S. Geological Survey Fact Sheet 022-11, February 2001.

24. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Generalized Computer Program, Version 3.1.3, Davis, California, April 2004.

25. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-GeoRAS, Generalized Computer Program, Version 4.1.1, Davis, California, January 2006.

26. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Generalized Computer Program, Version 3.0.1, Davis, California, March 2001.

27. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, 3.1.3, Hydraulic Computer Modeling Software, CPD-68, CPD-69, CPD 70, April 1997.

28. U.S. Geological Survey, Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains, Water Supply paper 2339, 1989.

29. The Fort Bend Subsidence District - Official Website - http://www.fbsubsidence.org/

30. A Study of the Relationship between Subsidence and Flooding, Turner Collie & Braden, Inc., Pate Engineers Inc., and Winslow & Associates Inc., Houston, Texas, December 1986

31. Technical Support Data Notebook – "DFIRM Update for Fort Bend County, Texas, Part 1 – Task 40 – Topographic Data Development" – Revised: June 2006

32. Turner, Collie & Braden, Inc., Channel and Bridge Improvement of Keegan. Bayou, September 1980.

33. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 55, Urban Hydrology for Small Watersheds, Washington, D. C., January 1975.

34. Lichliter/Jameson, Topographic Map, Scale 1"=200', Contour Interval 0.5 Foot; Seabourne Creek, March 1985.

35. International Aerial Mapping Company, Topographic Maps, Scale 1"-2,000', Contour Interval 1 Foot: Clodine Ditch, March 1984.

36. Federal Emergency Management Agency, Flood Insurance Study, First Colony Levee Improvement District, Washington, D.C., November 19, 1987.

37. Federal Emergency Management Agency, Flood Insurance Study, Fort Bend County Municipal Utility District No.2, Washington, D.C., Flood Insurance Study report dated May 15, 1984, Flood Insurance Rate Map dated November 15, 1984.

38. Federal Emergency Management Agency, Flood Insurance Study, Fort Bend County Municipa1 Utility District No. 25, Washington, D.C., February 4, 1987.

39. Federal Emergency Management Agency, Flood Insurance Study, Kingsbridge Municipal Uti1ity District, Washington, D.C., August 5, 1986.
40. Federal Emergency Management Agency, Flood Insurance Study, Mission Bend Municipal Utility District No.1, Washington, D.C., September 1987.

41. Federal Emergency Management Agency, Flood Insurance Study, Pecan Grove Municipal Utility District, Washington, D.C., August 4, 1987.

42. Federal Emergency Management Agency, Flood Insurance Study, Village of Pleak, Fort Bend County, Texas, Washington, D.C., August 5, 1986.

43. Federal Emergency Management Agency, Flood Insurance Study, City of Fulshear, Fort Bend County, Texas, Washington, D.C., August 19, 1987.

44. Federal Emergency Management Agency, Flood Insurance Study, City of Missouri City, Fort Bend County, Texas, Washington, D.C., December 17, 1987.

45. Federal Emergency Management Agency, Flood Insurance Study, City of Needville, Fort Bend County, Texas, Washington, D.C., March 4, 1987.

46. Federal Emergency Management Agency, Flood Insurance Study, City of Richmond, Fort Bend County, Texas, Washington, D.C., March 1;1982.

47. Federal Emergency Management Agency, Flood Insurance Study, City of Simonton, Fort Bend County, Texas, Washington, D.C., August 4, 1987.

48. Federal Emergency Management Agency, Flood Insurance Study, City of Stafford, Fort Bend County, Texas, Washington, D.C., Flood Insurance Study-report dated September 1, 1981, Flood Insurance Rate Map dated March 1, 1982.

49. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Kendleton, Fort .Bend County, Texas, April 29, 1980.

50. Federal Emergency Management Agency, Flood Insurance Study, Brazoria County and Incorporated Areas, Texas, Washington, D.C., September 21, 1999.

51. Federal Emergency Management Agency, Flood Insurance Study, Waller County and Incorporated Areas, Texas, Washington, D.C., February 18, 2009.

52. Federal Emergency Management Agency, Flood Insurance Study, Austin County and Incorporated Areas, Texas, Washington, D.C., June 16, 1999.

53. Federal Emergency Management Agency, Flood Insurance Study, Wharton County and Incorporated Areas, Texas, Washington, D.C., April 05, 2006.

10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that user is aware of all revisions, it is advisable to contract the community repository of flood hazard data listed on the FIRM index

10.1 Fifth Revision - , 2018

This PMR revises the map panels associated with the Sims Bayou watershed. It incorporates Risk Mapping, Assessment, and Planning (RiskMAP) products based on the hydrology and hydraulic models that were updated to reflect key changes in the Sims Bayou Watershed (HCFCD Unit # C100-00-00). These changes include recently complete US Army Corps of Engineers (USACE) channel modifications associated with the Federal Flood Damage Reduction Project on the Sims Bayou main stem, approved LOMRs from the date of the Effective FIS, effects of constructed regional detention facilities, and updating of the hydrologic and hydraulic modeling software. This 2014 Study was a joint effort between FEMA and its Cooperating Technical Partner (CTP), Harris County Flood Control District (HCFCD). The CTP Agreement was established under FEMA Contract No. EMW-2014-CA-00203, with Mapping Activity Statement (MAS) 21. Table 15 lists the revised scope of study streams for this 2014 RiskMAP Project. The work was completed in 2015.

Base Map information shown on this FIRM was derived from multiple sources. The FEMA National Flood Hazard Layer (NFHL) data provided base transportation and city limit information, 2015. The Texas Natural Resources Information (TNRIS) provided the Texas Department of Transportation (TXDOT) community boundaries and transportation layers dated 2015. Base map data was also provided by the Houston-Galveston Area Council (H-GAC) and from local communities and districts.

The hydrologic analysis was completed using the USACE HEC-HMS Version 4.0 computer program. The storage volume that represents the flow attenuation provided by the main stem of Sims Bayou was updated to reflect channel modifications completed by the USACE on Sims. The updated hydrologic model for the Sims Bayou watershed also incorporates three completed regional detention facilities, two of which are located on the main stem of Sims Bayou, C500-01-00 and C500-03-00, and one on a tributary, C547-01-00. Table 16 below summarizes the updated peak runoff rates at key locations along Sims Bayou and its tributaries.

The revised hydraulic analysis used the USACE HEC-RAS 4.1.0 computer program. Cross sections were obtained from the effective hydraulic models, “as-built” survey plans for modified or new bridges required to accommodate the improved channel, and 2008 topographic LiDAR. Roughness coefficients (Manning’s “n” values) used in the hydraulic computations are shown below in Table 17, “Revised Summary of Roughness Coefficients”, and were revised based on engineering judgement and based on field observations of the stream and floodplain areas.

Floodplain boundaries were delineated using Harris County’s contour data developed from 2001 LiDAR.

Floodway Data (Table 10) and Flood Profiles (C59(a)P – C64(a)P) were revised to reflect changes as a result of the study.

TABLE 12: REVISED SCOPE OF STUDY – FIFTH REVISION

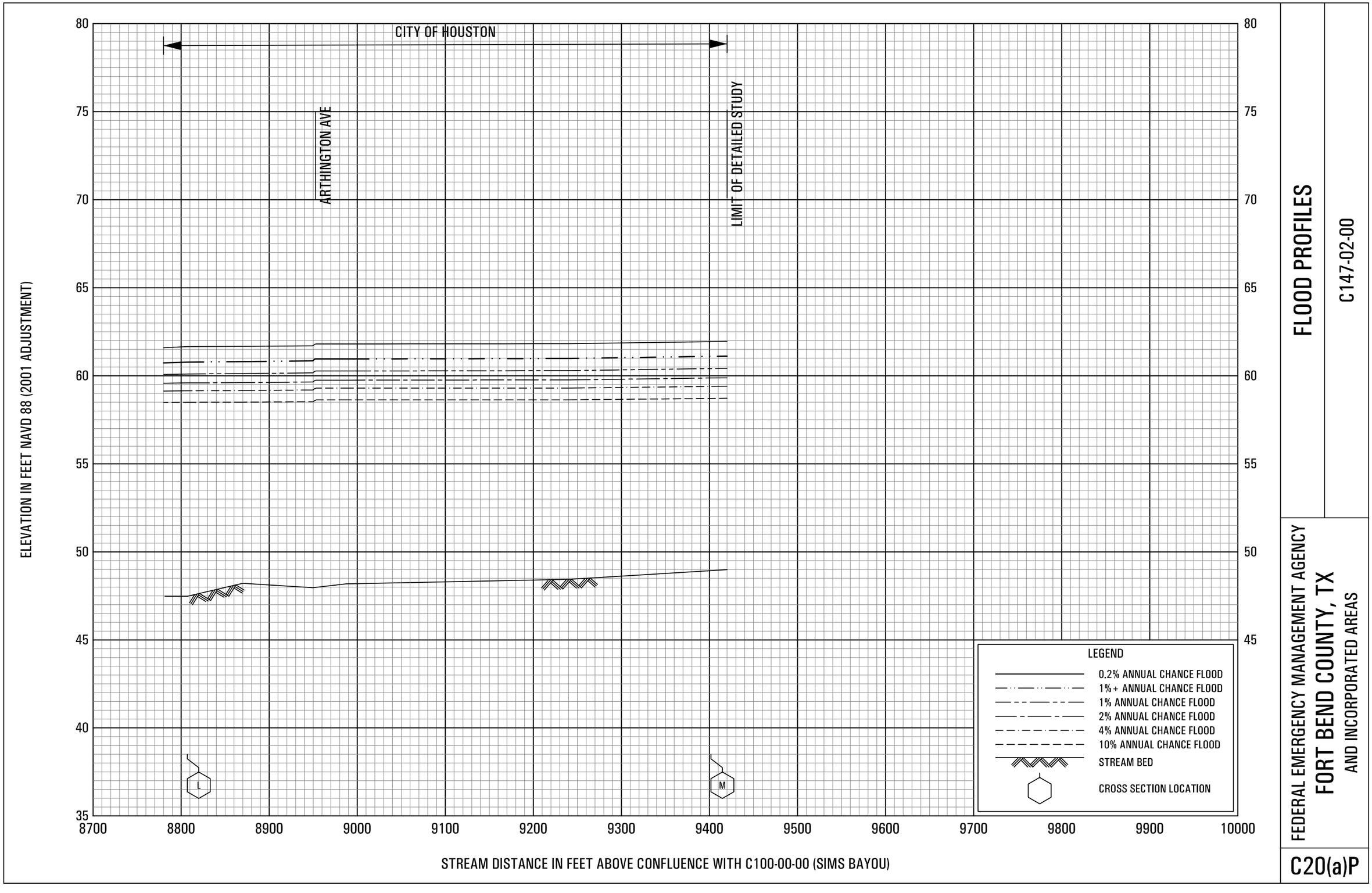
Detailed Study Streams	Limits of Detailed Study
Sims Bayou	From the County Boundary to approximately 250 feet upstream of Beltway 8 Frontage Road
Tributary 20.25 to Sims Bayou	From the Harris County/Fort Bend County Boundary to approximately 235 feet West of Corsar Road

Table 13: REVISED SUMMARY OF DISCHARGES – FIFTH REVISION

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (CFS) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
SIMS BAYOU					
Upstream of Sam Houston Parkway	2.26	704	1,088	1,291	1,895

Table 14: REVISED SUMMARY OF ROUGHNESS COEFFICIENTS- FIFTH REVISION

Detailed Study Streams	Channel "n"	Overbank "n"
Sims Bayou	0.015-0.045	0.050-0.200
Tributary 20.25 to Sims Bayou	0.020-0.040	0.080-0.200



FLOOD PROFILES

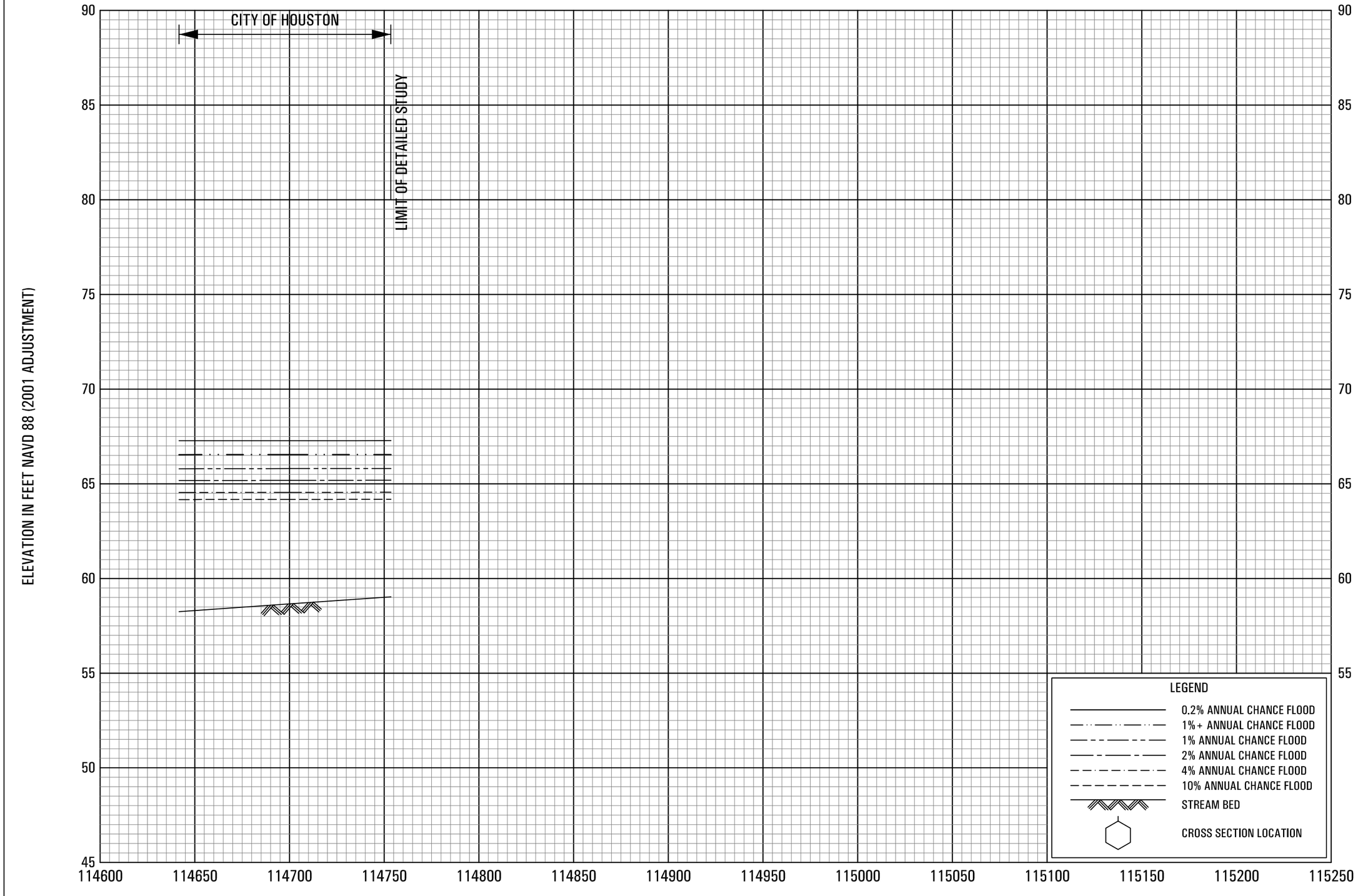
C147-02-00

FEDERAL EMERGENCY MANAGEMENT AGENCY

FORT BEND COUNTY, TX

AND INCORPORATED AREAS

C20(a)P



FLOOD PROFILES

SIMS BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

FORT BEND COUNTY, TX

AND INCORPORATED AREAS

C59(a)P